SERVICE MANUAL

Standard Horizon PF-P320 Paper Folder

Read this manual, and thoroughly familiarize yourself with its contents before operating or servicing this equipment.

PF-P320/SM

STANDARD

FOREWORD

Paper Folder

Model PF-P320

This manual is designed to help you to keep the machine in a good operating condition. Read, study and keep this manual in a safe and convenient place.

Do not perform any maintenance until you read and understand the instructions in this manual.

If you have questions regarding maintenance or this publication, please contact our service division.

The machine design and specifications are subject to change without notice.

⚠ Safety Instruction

1. Read and understand all safety instructions with a signal ⚠ **WARNING**, and ⚠ **CAUTION.** If safety instructions are ignored, personal injury will result.

2. HORIZON INTERNATIONAL INC. cannot anticipate every possible situation that might involve a potential hazard. The instruction in this manual are therefore not all inclusive.

3. Be sure to unplug the power cord when replacing the parts or repairing the machine.

4. Take care with the rotating parts when the machine is operated with the covers being opened.

5. Use the original HORIZON spare parts when replacing the parts.

I Necessary Tool for Maintenance and Repair

Use the following tools for maintenance and repair.

1.	Screw Driver	No. 2
2.	Screw Driver	6 to 7 mm
3.	Allen Wrenches	1.5, 2, 2.5, 3, 4, 5, and 6 mm
4.	Open-ended Wrench	5.5 x 7 mm 8 x 10 13 x 17
5.	Box Wrench	5.5 mm
6.	Snap-ring Expander	

II Signs and Abbreviations in This Manual

1. The following signs in this manual represent wire color.

Sign	Color
C	**Brown**
R	**Red**
O	**Orange**
Y	**Yellow**
G	**Green**
B	**Blue**
V	**Violet**
H	**Gray**
W	**White**
D	**Black**
S	**Transparent**
LY	**Light Yellow**
LG	**Light Green**
LB	**Light Blue**
P	**Pink**

2. The following abbreviations in this manual represent electronic and electrical parts.

Abbreviation	Meaning
CL	**Clutch**
BK	**Brake**
SW	**Switch**
mSW	**Microswitch**
M	**Motor**
LED	**Light Emitted Diode**
VR	**Potentiometer**
RY	**Relay**

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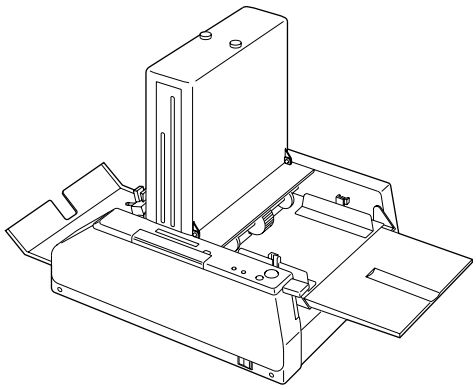
1. Specifications and Functions



A. Specifications

Model	PF-P320
Standard Sheet Size	A5 (manual setting), A4, A3, B4, B5 (5.5" x 8.5", 8.5" x 11", 8.5" x 14", 10" x 14", 9" x 11", 11" x 17")
Sheet Size	Maximum : 311 x 432 mm (12.2" x 17") Minimum : 65 x 90 mm (2.6" x 3.6") (90 mm is available single fold only)
Sheet Weight	50 to 105 gsm
Folding Speed	200 sheets / min. (A4, single fold) Folding speed slows 60% down with slow folding mode.
Maximum Pile Height	30 mm (1.2")
Power (Power Consumption)	100 V 50/60 Hz (150 W) 115 V 60 Hz (80 W) 230 V 50 Hz (90 W)
Machine Dimension	Tray Open : 956 x 493 x 582 mm (37.7" x 19.4" x 23") Tray Close : 677 x 493 x 582 mm (26.7" x 19.4" x 23")
Machine Weight	36 kg (79.4 lb)

B. Functions

Counter	4 digits total counter / Preset counter
Display Monitor	Indicates counter and troubles
Sensor	Sheet jam, buckle open/close, no sheet and set lever
Fold Length Indication	Display monitor indicates digital number by 1/5 mm. LED shows the position of eject roller. (Eject roller is positioned by hand.)
Memory of Irregular Folding	2 memories
Stopper Position	Can be positioned with keyboard.
Maintenance	Without any tool for replacing fold roller, pad, feed roller, sheet jam

2. Operation Overview

1. Turn on power switch.
   1st and 2nd stoppers move to home position automatically. Then stoppers moves according to fold pattern and sheet size memorized at previous operation. When feed tray lever rises at that time, motor, fold roller and delivery belts will rotate. When feed tray lever lowers, motor does not rotate.

   Display Indication
   " Please wait"
   ↓
   "Set Delivery Roller"
   ↓
   "0 / 0"

2. Push feed tray lever down.
   Motor will stop about 0.5 minute later.

3. Pile sheets into feed tray and select fold pattern with folding pattern select button. Stoppers move to set position according to fold pattern. Deflector is activated only when single fold pattern is selected.

   "Set Delivery Roller"
   ↓
   "0 / 0"

   "0 / 0"

4. Push feed tray lever up.
   Motor will rotate.

   "0 / 0"
   ↓
   "1 / 0"

5. Press test feed button.
   - Clutch will be activated and feed roller will make 1 turn and a sheet is fed.
   - If sheet is not piled on feed tray, motor will stop.

   "Empty Tray"

6. Press start/stop button.
   - Clutch will be activated and a sheet will be fed continuously or sheets will be fed continuously with some intervals (only accordion fold and short fold).

   "1 / 0"
   ↓
   Count Up
   ↓
   "50 / 0"

7. Sheet feeding stops.
   - Clutch will be off and only feed roller stops when start/stop button is pressed.

   - Clutch will be off and feed roller stops and motor stops when feed tray lever is lowered.

   - Feed roller stops when counter reaches input number in the case of preset counter is used.

   "0 / 50 Preset Stop"

   - Feed roller stops when sheets run out on feed tray.

8. Mode select button in memory mode has four modes ;
   - 1st stopper input mode
   - 2nd stopper input mode
   - Memory 1 memory mode
   - Memory 2 memory mode

"XXX.X Set Stopper 1"
"XXX.X Set Stopper 2"
"Memory 1 Press MEMORY"
"Memory 2 Press MEMORY"

- Stopper can be moved to set position with number entry keys in stopper input modes. For example, when required measurement is 132.5 mm, input 1325 with number entry keys.

"XXX.X Set Stopper No.1"

"132.5 Set Stopper No.1"

"Stopper Set OK"

- Input mode will be switched automatically from 1st stopper input mode to 2nd stopper input mode. (Modes will not be switched in the case of single mode.)
Display will be switched to counter mode after required measurement of 2nd stopper is input.

"XXX.X Set Stopper No.2"

"0 / 0"

- When only 2nd stopper input is required, press mode select button twice, and 2nd stopper input mode will appear.

9. Memory mode

"Memory 1 Press MEMORY"

- If mode select button is pressed three times, mode will be switched to memory 1 mode. If mode select button is pressed four times, mode will be switched to memory 2 mode.

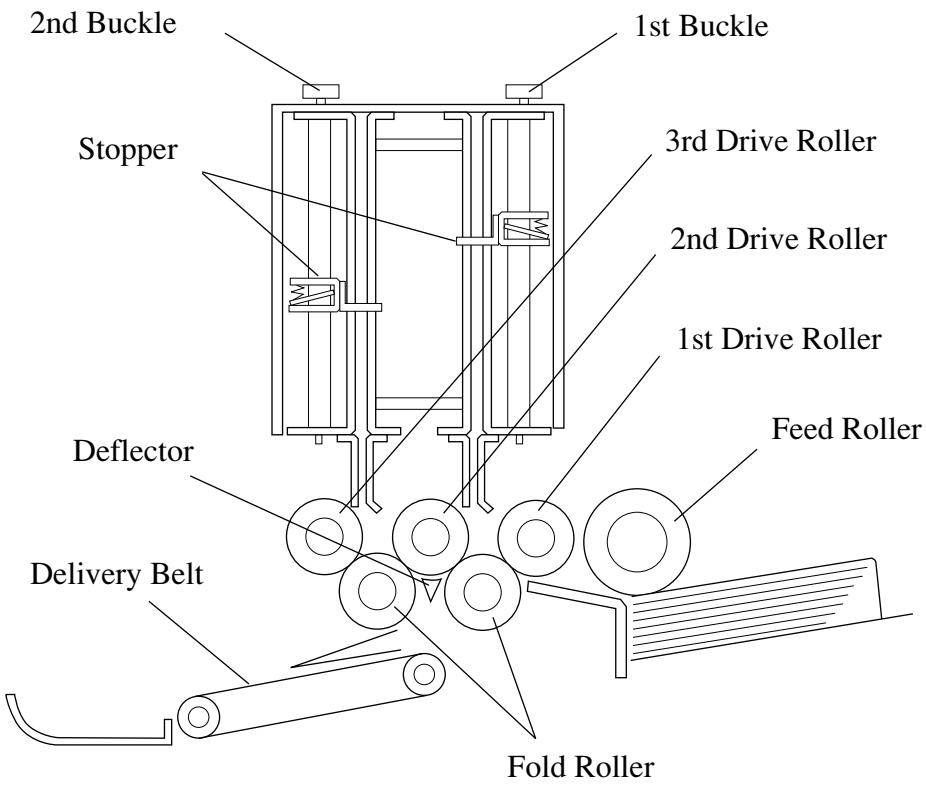
"0 / 0"

- If memory bouton is pressed with memory mode, stopper position will be displayed and input and monitor will be switched to counter mode automatically.

"Memory 1 Please wait."
"XXX.X XXX.X Memory 1"
"Memory 2 Please wait."
"XXX.X XXX.X Memory 2"

- Press mode select button once to read memory 1 ; press button twice to read memory 2.

3. Sheet Flow



1. Feed roller feeds sheet to 1st drive roller.

2. Sheet is nipped between 1st drive roller and fold roller and then transported to 1st buckle.

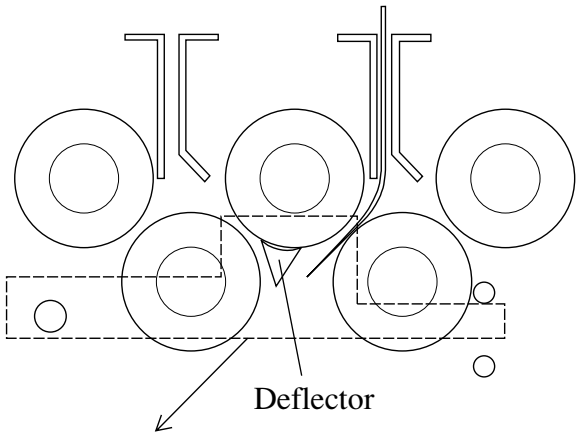
3. When sheet reaches to stopper in 1st buckle, sheet is buckled and the buckled part of sheet is nipped between 2nd drive roller and fold roller.

4-1. In the case of single fold, deflector moves up and sheet is delivered to delivery belt.

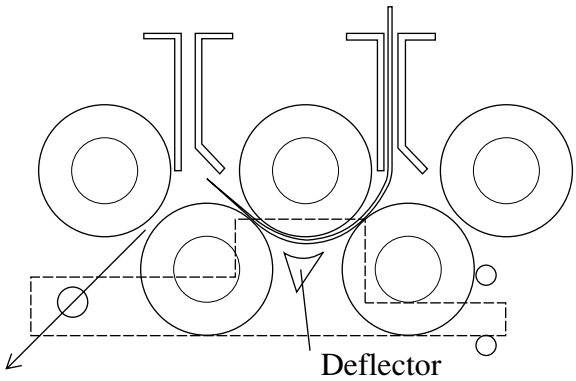
4-2. In the case of the other folding patterns, deflector moves down and sheet folded between 2nd drive roller and fold roller is transported to 2nd buckle.

5. When sheet reaches to stopper in 2nd buckle, sheet is buckled and the buckled part of sheet is nipped between 3rd drive roller and fold roller.

6. Sheet is folded and delivered to delivery belts.



Single Fold



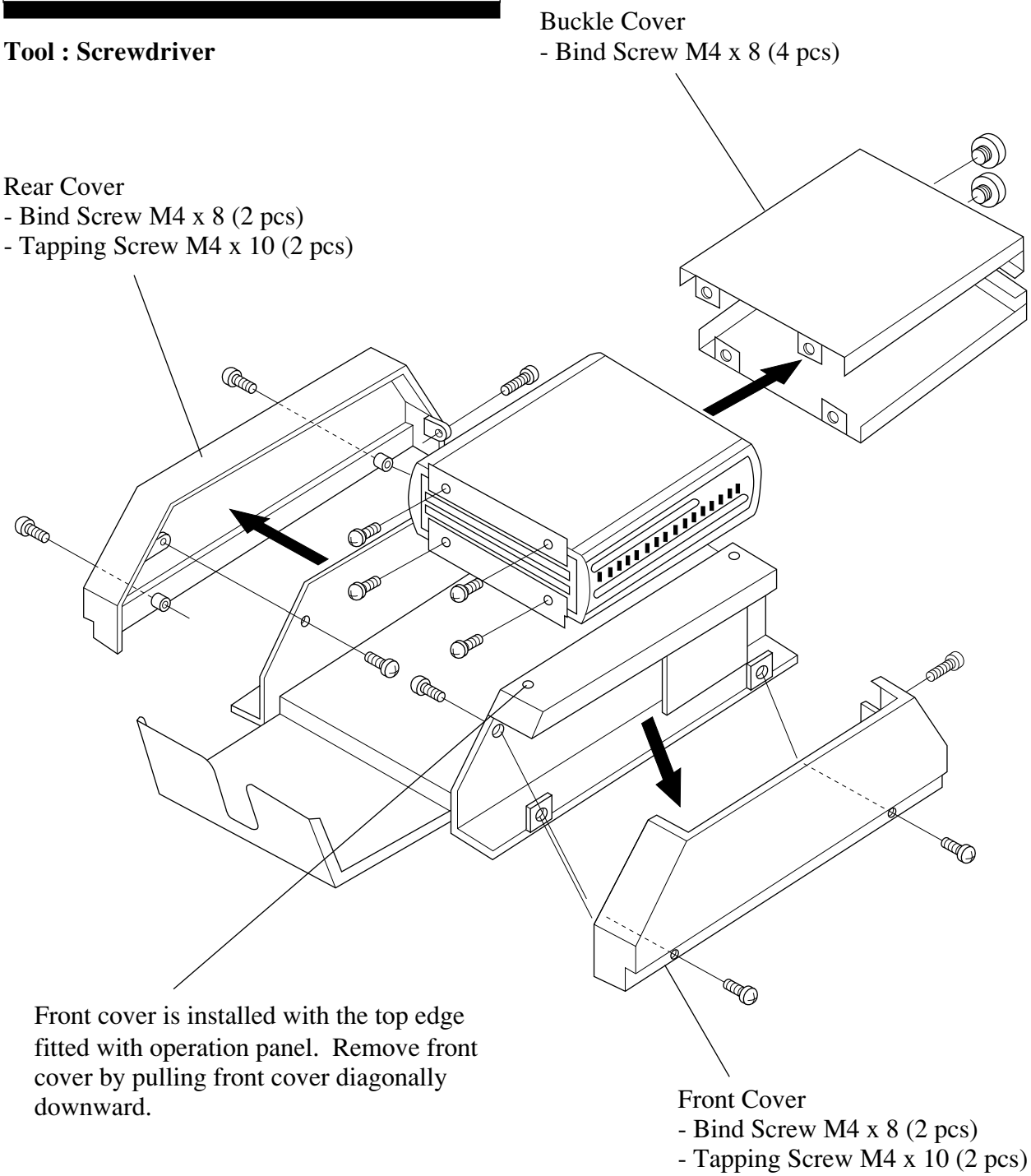
The Other Folding Patterns

4. How to Remove Covers

⚠ *CAUTION*

- Turn off main power and remove any covers.

Tool : Screwdriver


Buckle Cover
- Bind Screw M4 x 8 (4 pcs)
Rear Cover
- Bind Screw M4 x 8 (2 pcs)
- Tapping Screw M4 x 10 (2 pcs)
Front cover is installed with the top edge fitted with operation panel. Remove front cover by pulling front cover diagonally downward.
Front Cover
- Bind Screw M4 x 8 (2 pcs)
- Tapping Screw M4 x 10 (2 pcs)

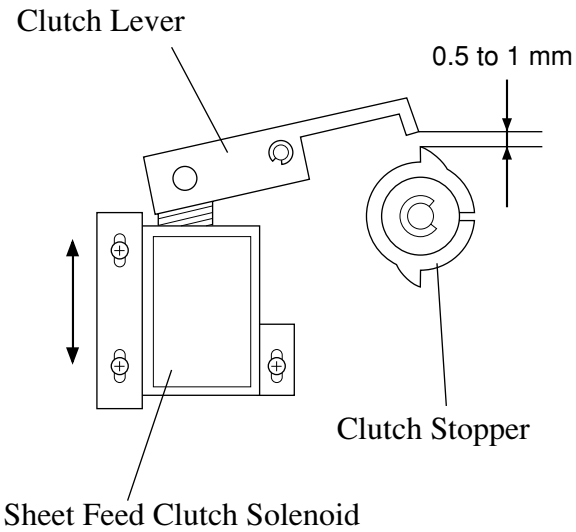
5. Troubleshooting

A. PF-P320 Does Not Work with Start Button or Test Feed Button

(Cause 1)
Feed clutch solenoid is not positioned properly.

(Remedy 1)
Adjust the position of feed clutch solenoid so that the clearance between clutch lever and clutch stopper is 0.5 to 1 mm (0.02" to 0.04") while feed clutch solenoid is on.

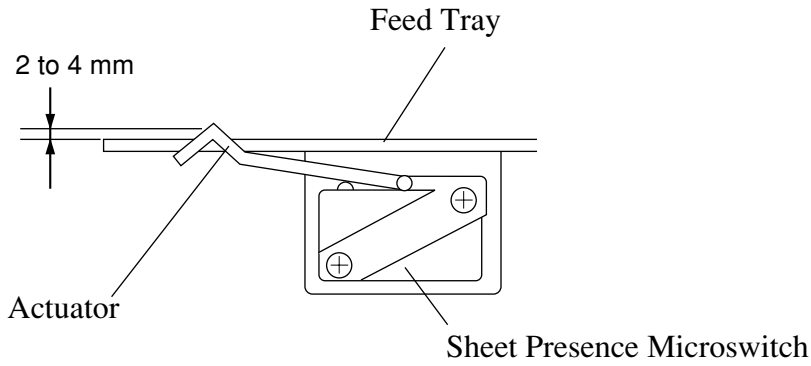
NOTE
- Fix feed clutch solenoid so that feed clutch solenoid will not hit clutch lever.



(Cause 2)
Sheet presence microswitch on the top of feed tray is broken, sheet sensor microswitch is not positioned properly, or connector is not connected properly.

(Remedy 2)
- Check or replace sheet presence microswitch from the square opening on the bottom of frame.

- Position microswitch so that actuator ON position where click sound is heard is 2 to 4 mm (0.08" to 0.16") above feed tray.



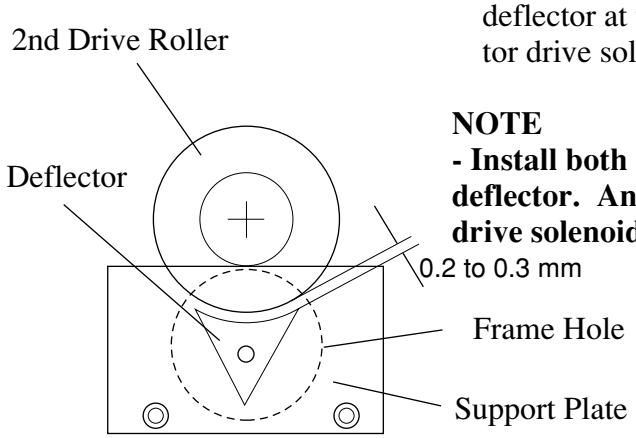
(Cause 3)
Start/Stop button is broken.

(Remedy 3)
Replace switch or whole P.C. Board.

5. Troubleshooting

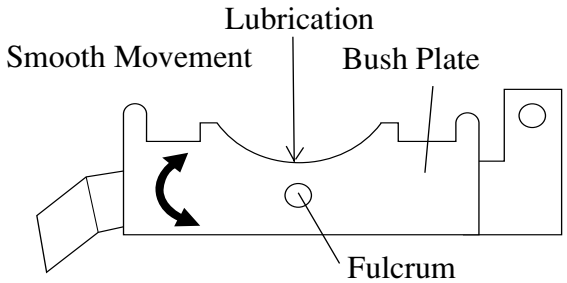
B. Sheets Is Not Folded Correctly with Single Fold

(Cause)	(Remedy)
Deflector is deformed or deflector drive solenoid is not positioned properly.	Adjust deflector so that the clearance between 2nd drive roller and deflector is 0.2 to 0.3 mm (0.008" to 0.02") from drive side to operation side while deflector drive solenoid is on. And also install deflector so that tip of deflector at the left side touches frame hole while deflector drive solenoid is off.



NOTE
- Install both sides of support plates without twist of deflector. And adjust support plate so that deflector drive solenoid will operate without hitting other parts.

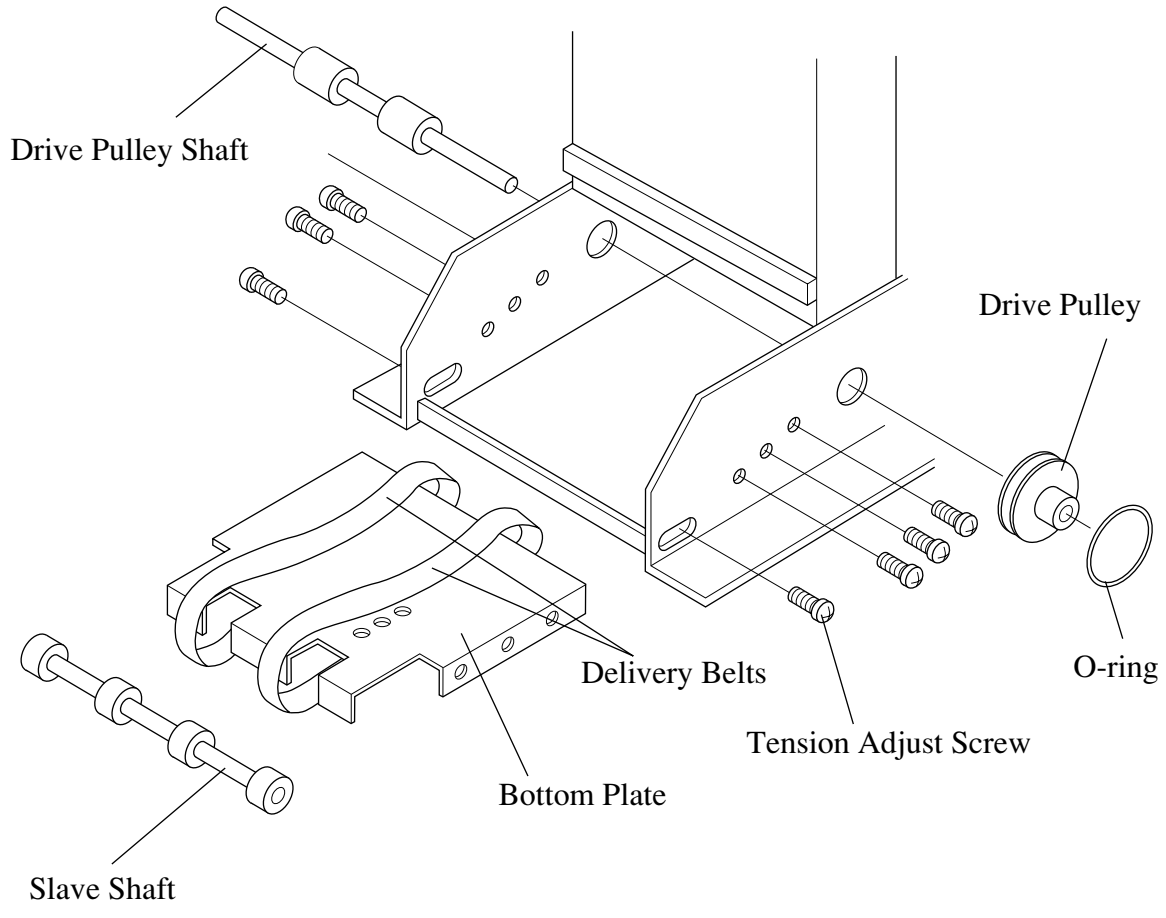
C. Folded Sheet Have Wrinkles

(Cause 1) Sheets are too thin. Sheets are curled.	**(Remedy 1)** Set double feed stop pad and feed tray pressure at weak. Also slow down operation speed with speed select button.
(Cause 2) Buckles are not set up properly.	**(Remedy 2)** Set up buckle again.
(Cause 3) Fold rollers are not set up properly.	**(Remedy 3)** Install fold rollers in proper position.
(Cause 4) Fold roller are smeared with ink.	**(Remedy 4)** Clean fold rollers with alcohol soaked cloth.
(Cause 5) Fold rollers are deformed by friction after long time use.	**(Remedy 5)** Replace fold rollers.
(Cause 6) Bush plates have some problems.	**(Remedy 6)** Check that bush plates are not deformed and that they operate smoothly. After that lubricate fulcrum of bush plate. 

5. Troubleshooting

D. Delivery Belts Do Not Work

(Cause 1) Sheet slips on delivery belts because delivery belts are loosen.	**(Remedy 1)** **a) Tension Adjustment** Loosen tension adjust screw and adjust tension of delivery belts. **b) Delivery Belts Replacement** Remove bottom plate of delivery belts and then drive pulley shaft and slave shaft. Replace delivery belts with new ones.
(Cause 2) O-ring on drive pulley slips.	**(Remedy 2)** If drive pulley slips on delivery belt, clean o-ring on drive pulley with alcohol-soaked cloth. If drive pulley slips nevertheless, replace drive pulley with new one.

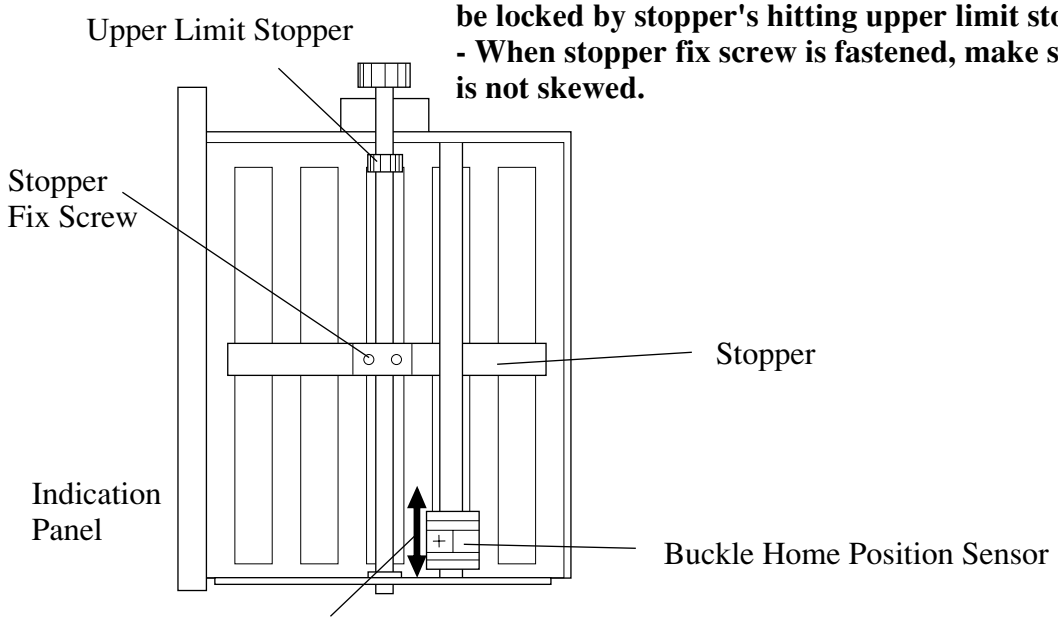


5. Troubleshooting

E. Finished Size Is Not the Same As Set Up Size

(Cause) Buckle home position sensor is not positioned properly.	**(Remedy)** Loosen stopper fix screw, then buckle home position sensor can be move up/down by 4 mm.

NOTE
- Adjust sensor within 2 mm. Otherwise PF-P320 may be locked by stopper's hitting upper limit stopper.
- When stopper fix screw is fastened, make sure stopper is not skewed.



F. Misfeed Occurs (Feed Roller Rotates)

(Cause 1) Sheet is too thick. (Out of specification)	
(Cause 2) Fold rollers are worn out. Fold rollers get worse.	**(Remedy 2)** Replace feed rollers.
(Cause 3) The pressure of double feed stop pad is too strong.	**(Remedy 3)** Weaken pressure of double feed stop pad.
(Cause 4) Feed tray does not operate correctly because spring is loosen.	**(Remedy 4)** Check on feed tray movement or replace spring in feeding section.
(Cause 5) Sheet is caught between feed guides as they are too tight.	**(Remedy 5)** Readjust feed guide.
(Cause 6) Feed tray pressure is weak	**(Remedy 6)** Set feed tray pressure at standard or strong.

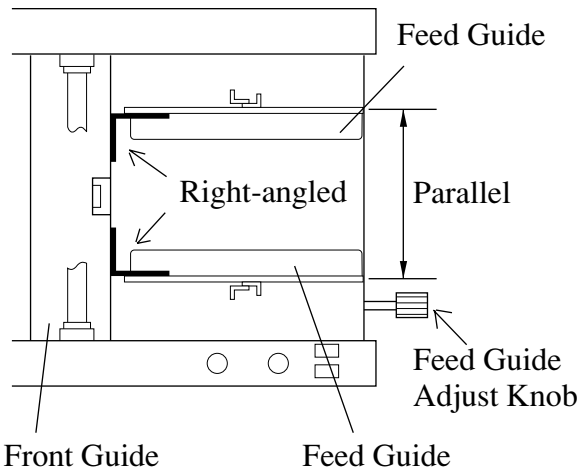
5. Troubleshooting

G. Double Feed Occurs

(Cause 1) Sheet is too thin. (Out of specification)	
(Cause 2) Feed roller or double feed stope pad is worn out.	**(Remedy 2)** Clean double feed stop pad or replace it with new one.
(Cause 3) Sheets are curled. Sheets stick each other with ink.	**(Remedy 3)** Fan sheets well.
(Cause 4) Sheets have static electricity.	**(Remedy 4)** Fan sheets well a few minutes later.

H. Folding Result Is Not Good

(Cause) Sheet is too thin. (Out of specification) Sheet is not cut square. Sheet is curled.	
(Cause) Feed guides are set improperly.	**(Remedy 1)** Adjust feed guides so that feed guides are right-angled with front guide and feed guides are parallel each other.



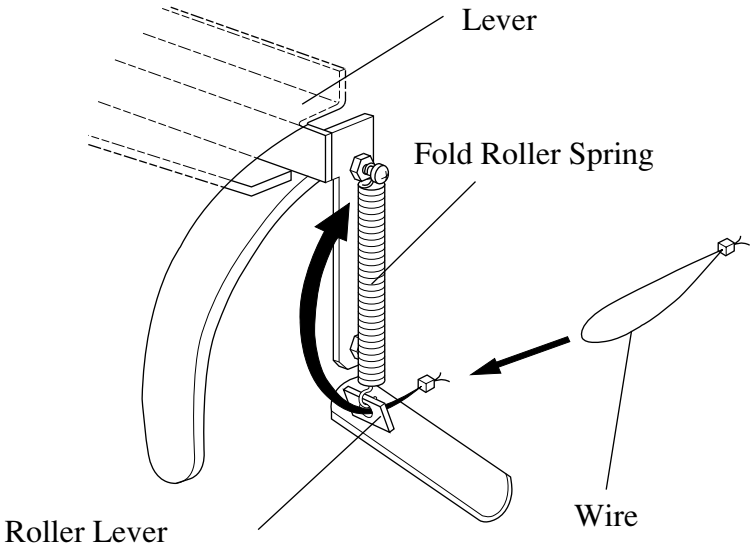
(Continued on the next page)

5. Troubleshooting

(Cause 2)
Fold roller spring is loosen.

(Remedy 2)
Replace fold roller spring.

NOTE
- In case wire is cut, replace wire as shown in the drawing below.



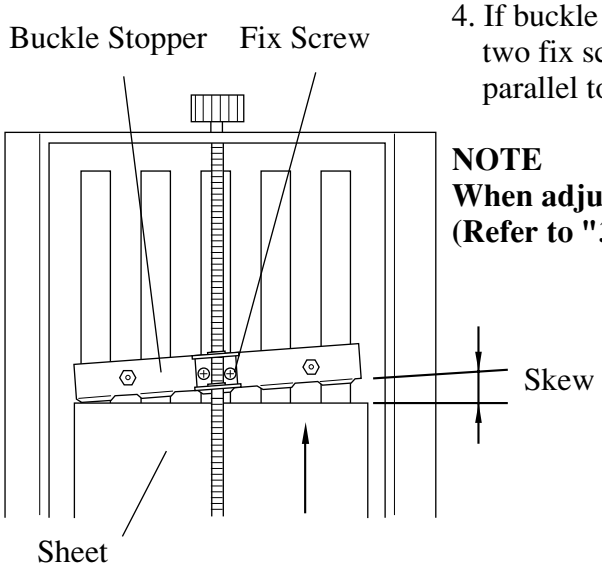
(Cause 3)
Stopper in buckle is set improperly.

(Remedy 3)
1. Turn power off and remove buckle cover.

2. Feed a sheet to buckle by turning feed roller by hand. Make sure that sheet is not skewed.

3. Check that the leading edge of sheet is parallel to buckle stopper.

4. If buckle stopper is not parallel with sheet edge, loosen two fix screws and adjust stopper angle so that it will be parallel to sheet.



NOTE
When adjusting buckle stopper, use exactly square sheet.
(Refer to "3. How to Remove Covers" in page 6.)

(Continued on the next page)

(Cause 4) Fold rollers are dirty with ink.	**(Remedy 4)** Clean fold rollers with alcohol soaked cloth.
(Cause 5) Sheets are jammed in buckle.	**(Remedy 5)** Remove all jammed sheets in buckles.
(Cause 6) Support rollers are set improperly.	**(Remedy 6)** Readjust support roller position.
(Cause 7) Feed roller or double feed stope pad is worn out.	**(Remedy 7)** Replace feed roller or double feed stop pad.
(Cause 8) Fold roller is worn out.	**(Remedy 8)** Replace fold rollers.

5. Troubleshooting (Electronic Control)

[1] "Error Check Breaker" Is Still Indicated in Spite of Turning Power on

(Cause 1) Circuit breaker for buckle is tripped because of sheet jam.	**(Remedy 1)** Push breaker button below feed tray. (Refer to page 16.)
(Cause 2) Stopper in 1st or 2nd buckle is locked at top dead end.	**(Remedy 2)** Turn off power and lower stopper with stopper microadjust knob and turn on power again. In case 2nd buckle stopper is raised and locked as soon as power is turned on, press reset button (Refer to "[5] Buckle Stopper Lowers Further After It Stops at Bottom Dead End".) or replace control P.C.B. with new one.
(Cause 3) Stopper in 1st or 2nd buckle is locked at bottom dead end.	**(Remedy 3)** Turn off power and raise locked buckle stopper about 20 mm and turn on power again. In case buckle stopper is locked at bottom dead end as soon as power is turned on, check function of buckle home position sensor with LED on control P.C.B.. (Refer to page 17.) If sensor is not activated, replace sensor with new one or press reset button to reset memory (Refer to [5].) or replace whole control P.C.B. with new one.

[2] Monitor Remains "0 / 0" and Motor Does Not Rotate

(Cause 1) Sheet is jammed between fold rollers or in buckle.	**(Remedy 1)** Remove jammed sheet between fold rollers or in buckle.
(Cause 2) Feed tray position microswitch is not activated.	**(Remedy 2)** Check function of position sensor with LED on control P.C.B.. If sensor is not activated, adjust position of sensor or replace sensor. If sensor is working correctly and motor does not rotate, check on fuse 3A. (Refer to page 16.) If sensor is not still activated, replace whole control P.C.B. with new one.
(Cause 3) Buckle stopper(s) is(are) locked.	**(Remedy 3)** When buckle stopper is locked at bottom dead end, follow the above remedy [1]-3. When stopper is locked at top dead end, check function of buckle stopper encoder sensor with encoder sensor LED on control P.C.B.. (Refer to page 17.) If sensor does not work, replace sensor with new one. If sensor works, replace control P.C.B..

5. Troubleshooting (Electronic Control)

[3] "0 / 0 Jamming" Indication on Monitor Appears After 3 to 4 Sheets. Then Folding Can Not Be Started with START Button

(Cause 1) Counter sensor is covered with dust or alike.	**(Remedy 1)** Clean sensor. (Refer to page 17.) If the error is not recovered, sensor is broken or sensor wire is cut. Replace sensor or check wires or replace control P.C.B..
(Cause 2) Irregular size sheets are used or folding pattern is not regular pattern.	**(Remedy 2)** Select short fold or accordion fold with fold pattern select button to provide interval between sheets and move buckle stopper to required fold position by hand.
(Cause 3) Sheet is jammed in sensor unit or buckle.	**(Remedy 3)** Remove jammed sheet.

[4] Alarm Continues Sounding When Power Is on or Lamps of Folding Pattern and Sheet Size Do Not Illuminate Correctly

(Cause) Memory in CPU may be broken.	**(Remedy)** Press reset button to clear memory in CPU. If PF-P320 does not work properly still, replace control P.C.B..

[5] Buckle Stopper Lowers Further After It Stops at Bottom Dead End

(Cause) Memory in CPU may be broken.	**(Remedy)** Turn off power and raise locked buckle stopper about 20 mm by hand. And then turn on power again during pressing clear button. (Memory in CPU will be cleared and buckle stopper must be stopped at bottom dead end.) In case buckle stopper is locked at bottom dead end as soon as power is turned on, replace whole control P.C.B. with new one.

[6] "Close Buckle" Indication on Monitor Remains to Be Shown

(Cause) Stopper plate for buckle is not set properly or buckle open sensor does not work correctly, or sensor wire is cut.	**(Remedy)** Check that buckle open sensor works correctly with buckle open LED on control P.C.B.. If not, adjust the position of buckle stopper or check wires. If not still, replace control P.C.B..

[7] "0 / 0 Feed Error" Is Indicated on Monitor After 3 to 4 Sheets

(Cause)	(Remedy)
Counter sensor unit may be broken.	Check that counter sensor works correctly with counter sensor LED on control P.C.B.. And check sensor wires are cut or short-circuit. If LED illuminates correctly, replace receiver of sensor. If the error is not still recovered, replace both receiver and projector of sensor. If not still, replace control P.C.B..

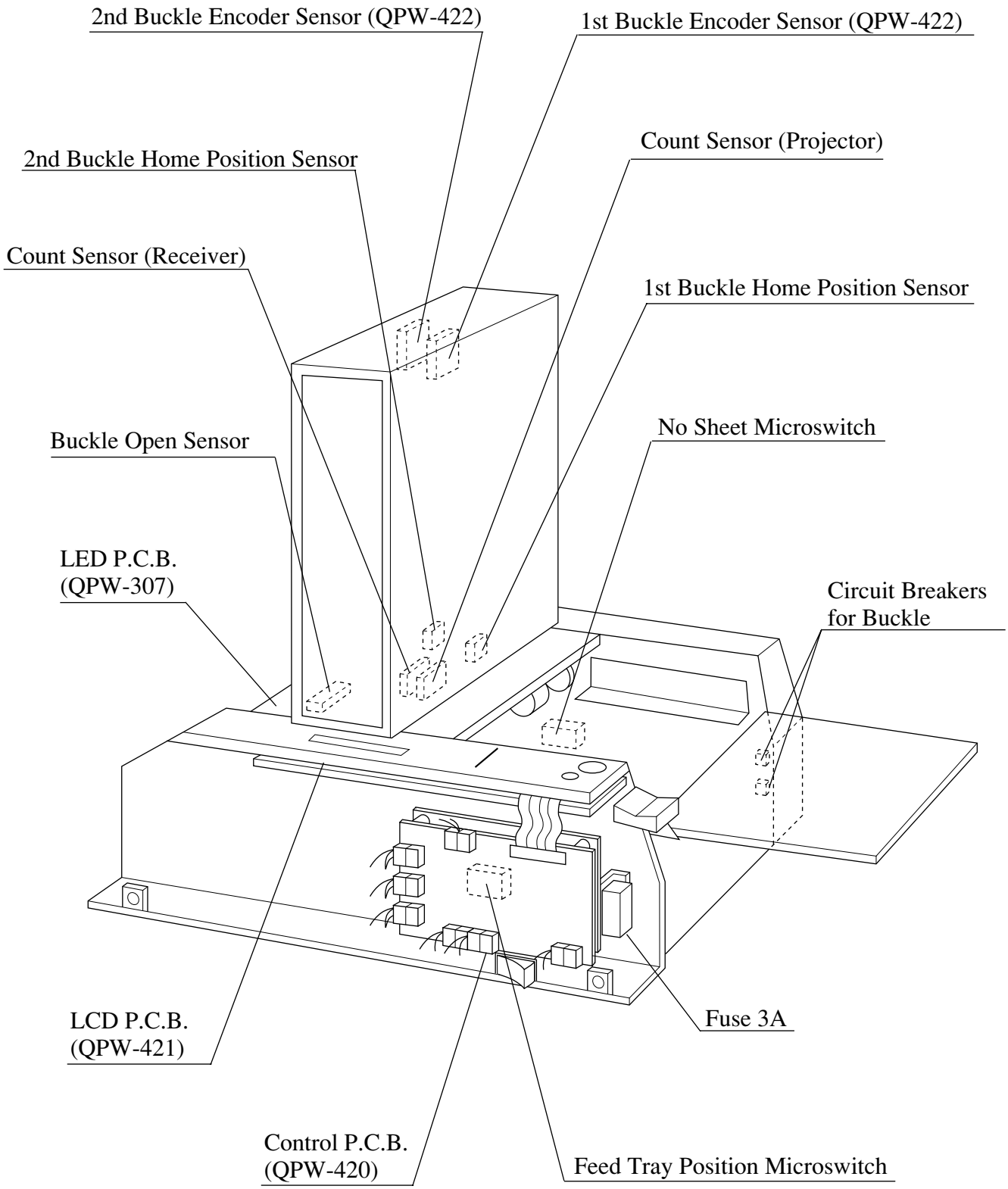
[8] When Power Is on, Buckle Returns to Home Position and Rise to Top Dead End and Then Is Locked (Circuit Breaker Trips)

(Cause)	(Remedy)
Buckle encoder sensor is broken.	Check on buckle encoder sensor with encoder sensor LED on control P.C.B.. (Refer to page 17.) If 1st buckle is normal, LED 5 and 6 flash one after the other ; if 2nd buckle is normal, LED 1 and 2 flash one after other. If either of LEDs illuminates, replace sensor. If sensor is normal, replace control P.C.B..

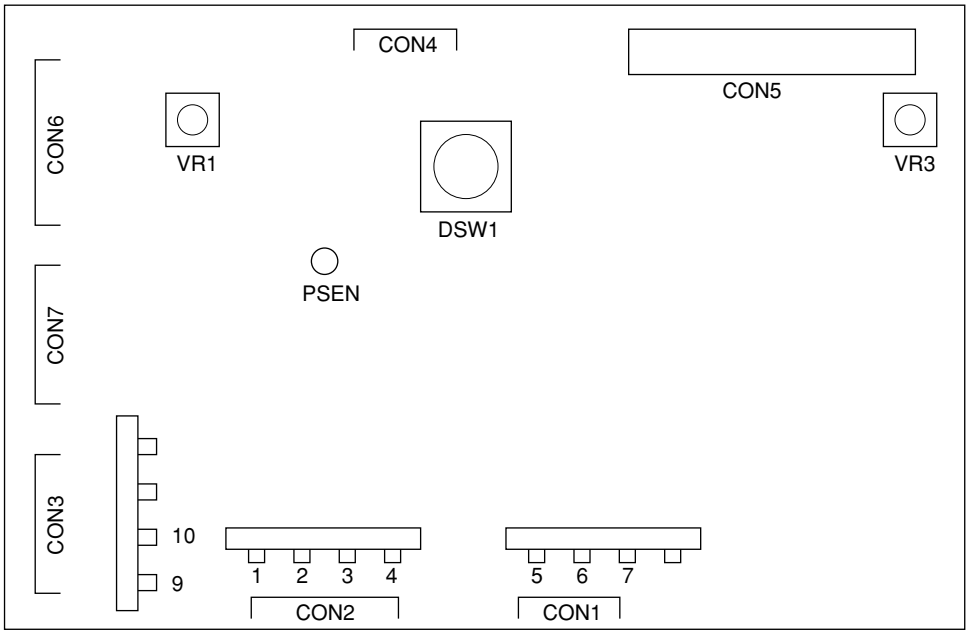
6. Message List

"Error Check Breaker"	➞	This will be indicated when stopper does not return to home position in time after power switch is turned on.
"Please wait."	➞	This will be indicated while stopper is moving when power is turned on.
"Empty Tray"	➞	This will be indicated when feed tray is empty.
"Raise Tray"	➞	This will be indicated when start or stop button is pressed without raising feed lever.
"Close Buckle"	➞	This will be indicated when buckle is open.
"0 / 0"	➞	This will be indicated after stopper is finished setting up.
"XXX /XXXX Preset Stop"	➞	This will be indicated when folding stops after preset number folding.
"0 / 0 Jamming"	➞	This will be indicated when sheet is jammed in buckle or between fold rollers.
"0 / 0 Feed Error"	➞	This will be indicated when sheet is not fed.
"XXX.X Set Stopper No.1" "XXX.X Set Stopper No.2"	➞	This will be indicated with stopper input modes.
"Memory 1 Press MEMORY" "Memory 2 Press MEMORY"	➞	This will be indicated with memory modes.
"Memory 1 Please wait."	➞	This will be indicated during reading memory 1.
"Memory 2 Please wait."	➞	This will be indicated during reading memory 2.
"XXX.X XXX.X Memory 1"	➞	This will be indicated after reading memory 1.
"XXX.X XXX.X Memory 2"	➞	This will be indicated after reading memory 2.
"Stopper Set OK"	➞	This will be indicated when stopper is set after inputting number.
"Set Delivery Roller"	➞	This will be indicated while stopper is moving.

7. Sensor and Electronic Parts Descriptions



8. LED Descriptions and DIP SW Set Up



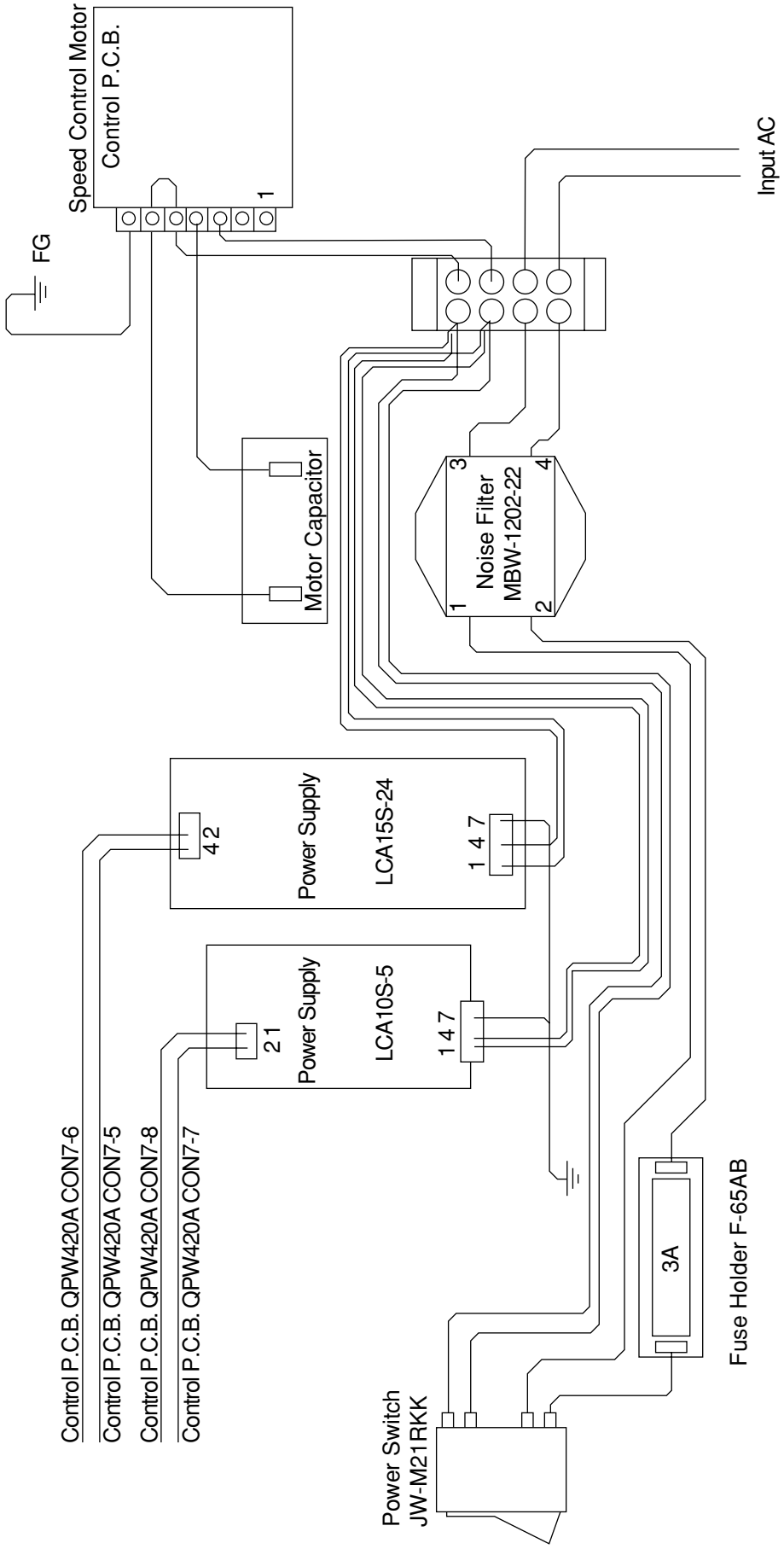
LED
1. 2nd Stopper Encoder Sensor A
2. 2nd Stopper Encoder Sensor B
3. 2nd Stopper Home Position Sensor
4. Buckle Open Sensor
5. 1st Stopper Encoder Sensor A
6. 1st Stopper Encoder Sensor B
7. 1st Stopper Home Position Sensor
8. Not Used
9. Sheet Presence Microswitch
10. Feed Tray Position Microswitch

PSEN Count Sensor

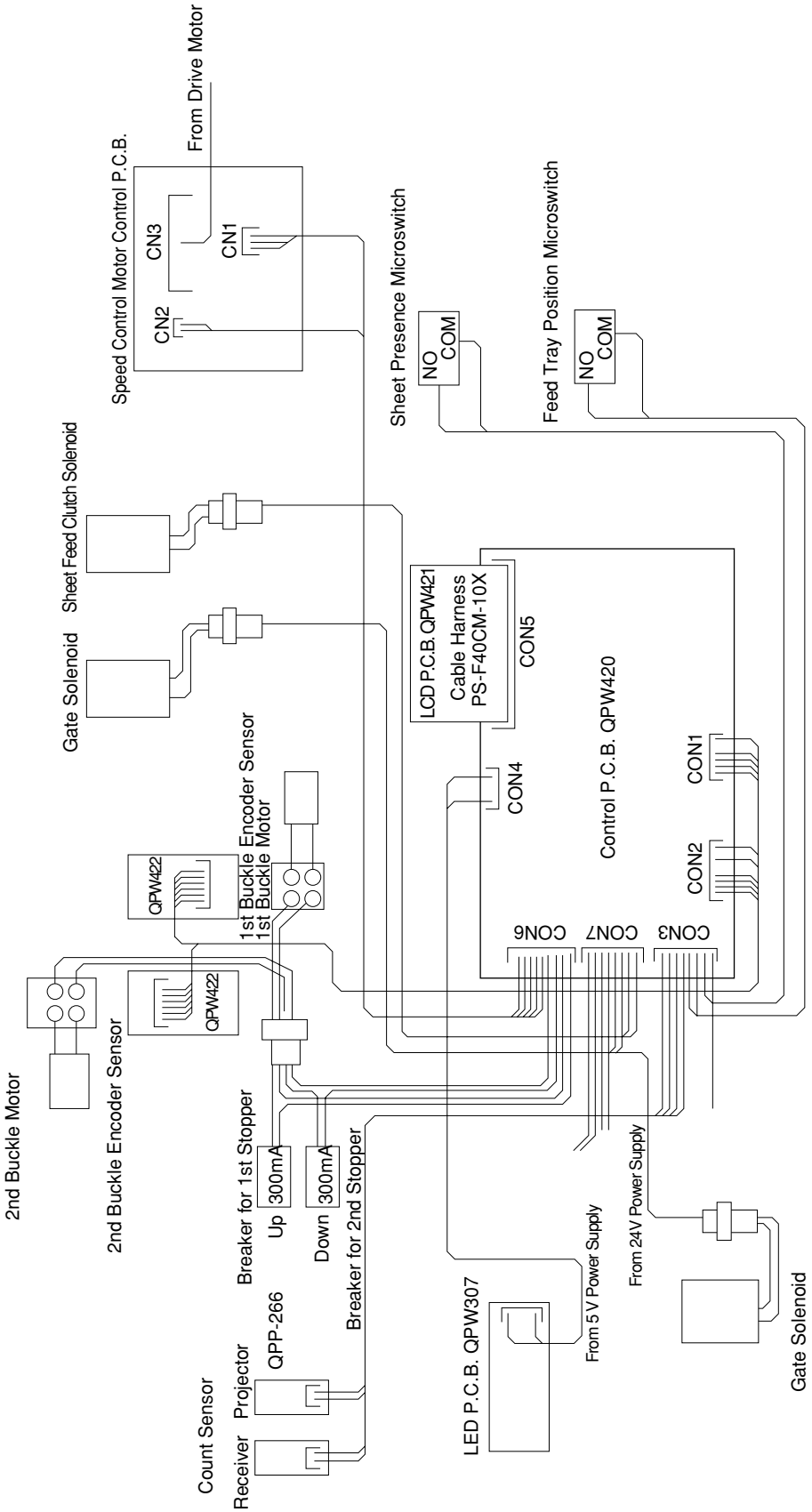
VR1 Slow Speed Adjustment VR
VR3 LCD Brightness Adjustment VR

DSW1
0 Not Used
1 Japanese mm
2 English inch
3 English mm

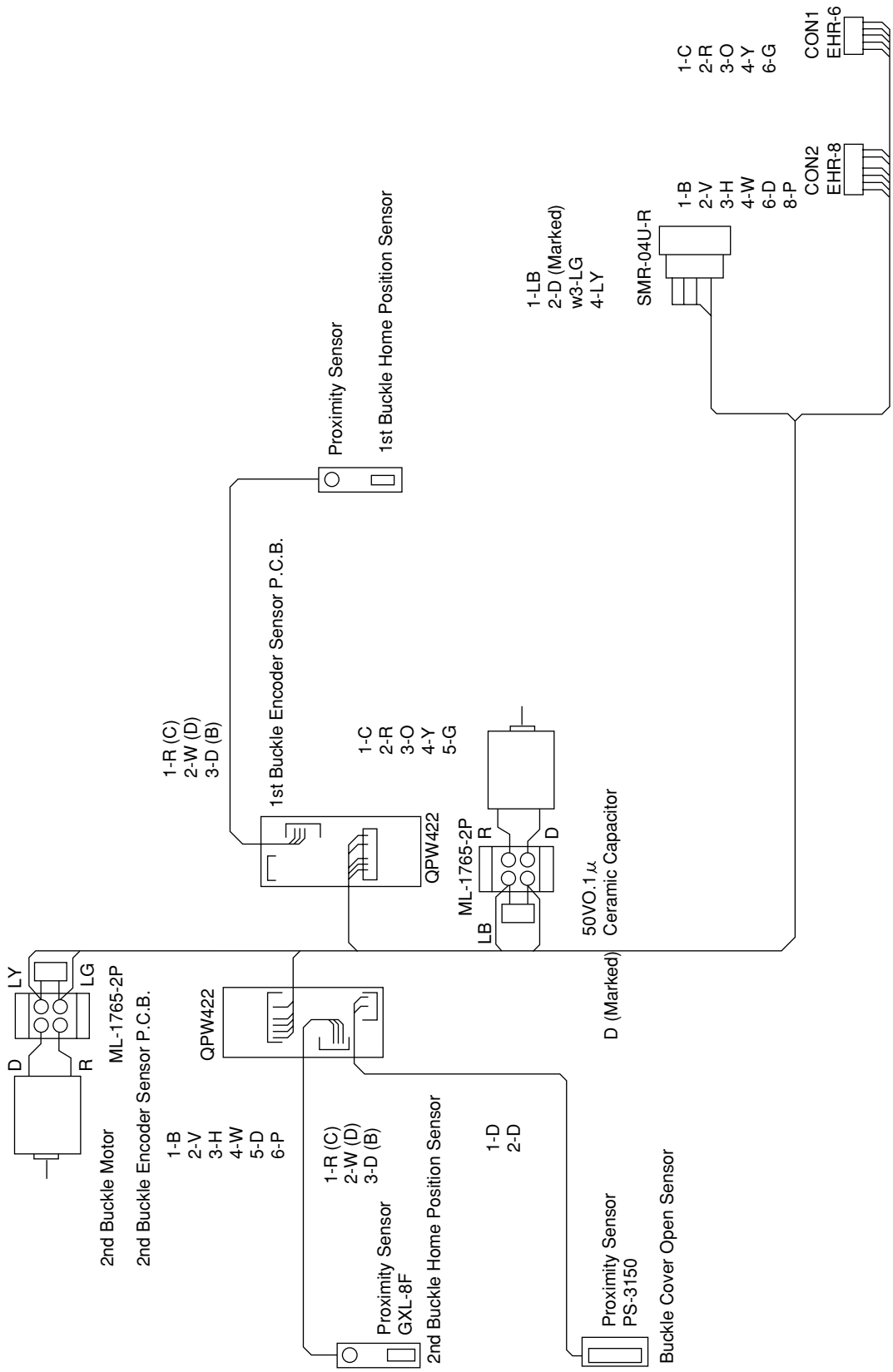
9. Drive Section Line Diagram



10. Control Section Signal Line Diagram



11. Buckle Section Line Diagram



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